

What Science Is

Fourth Edition

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Written for and dedicated to the Kiwi Farms

The purpose of this text is to inform the Kiwi public on the nature of science. "Popularizers", "Communicators", and liars discredit science for their own personal gain in payment or popularity.

What Science is not

Science is not truth. Science is not the verification of truth in specific or verification in general. Science is not the repeatability of experiment, it is not uncontroversial; it is not testable proof. It is certainly not objective, and no two people ever see it the same way. The limits of our human lives prevent us from ever fully exploring the available contents of human knowledge. The average university library may contain fifty thousand books and a dedicated reader may complete fifteen thousand in their lifetime. Every scientist will be left with gaps in their knowledge, no matter how dedicated they may be. Human experience, the sum total of human perception and theory, is too much to ever possibly be understood by a single person. The absence of knowledge is two fold: an unaware person is unaware that they are unaware. Therefore no human can ever contemplate all of science. And if no human fully understands science can he claim to be a scientist? The reason why man can study science while being unaware of their study is because science is not the repetition of facts, it is not the ability to recite taught lessons, or to reiterate solutions to known questions. Science does not depend upon a knowledge of already discovered facts. Science does not require formal training in procedures, traditions, dogmas, or other explanations. Just as no one human can ever contemplate all of science, no one can ever construct a single unifying theory or easily communicated model of science to act as a standard.

It seems that the postmodern public has taken science to be their new religion. They attach to science all the old ceremonial ornaments that religion used to wear: truth, verifiability, access to knowledge, control over nature, fate and destiny, man's place in the world, the existence of higher life and the afterlife. In my experience science has led me to no conclusive answer, just my own satisfied opinion. Science is far too dangerous for such blind assignments. Scientific claims need to be clear and distinct, they cannot be incorrectly stated because the implied thought is simply too much to bear. Because of this implication I do not buy into the concept of innocent knowledge. Every act of acquiring knowledge is, at its core, an exercise of influence or, at the very least, possesses the potential for such influence. Knowledge is inherently power.

This kind of limited thinking is exactly the opposite of the kind of thought fostered by scientific exploration. Such vulgar interpretation of appearances does not bring understanding, much less guide future exploration.

Human Experience

The origin of science lies in human sense perception. Lacking any other tools to meaningfully explore the world, man uses his senses. The situation is the same today. No further progress has been made in actually *seeing* nature, and not just seeing it. Actual perception of the thing is achieved by abstract understanding of things unseen. Man has not increased his ability to perceive nature; he must arrange the experiences he receives in his own mind, and with a mental map he may then be able to understand nature.

The Error of Primacy in Sense Perception

Fools may disagree with the assertions that I have made above: they may try to argue from sense or instrument perception. Every mercury thermometer works in exactly the same way, given similar composition, they say. The microscope allows us to visibly perceive microorganisms and the thermometer provides reliable data points. Ah, but the information that is lost! And let's not forget the fact that the data points are arbitrarily assigned meanings and have no inherent interpretation on their own. We decided that these measurements would be meaningful, how convenient! Which parts of the observation are purposefully ignored? The mercury thermometer is merely a relation between two sense perceptions that humans have decided to be meaningful. The instrument has been calibrated subjectively, and gives no objective measurement. We may not always know exactly what our biases are when we make our observations or instrumental perceptions, but we can be sure that we do not make absolute universal statements. Observing the microorganism from one perspective denies the observer all other perceptive possibilities! Opportunity cost is built into nature! Heisenberg has already helped us understand this phenomenon at a physical level, with the uncertainty between position and momentum. No one, ever, will be able to fully perceive the situation as it truly is. Information, and a significant part of the available observational information, will inevitably be lost. Accuracy and precision, supposed columns of scientific rigor, are nowhere to be seen.

Our perception of reality hinders us from seeing as it really is. So why not put on some blinders and try to look ever more carefully at the object? Is that not what science is? An exclusive exploration of a subject at the expense of others? This makes the situation worse! The observer becomes even more blinded to reality than before. Excluding some parts of reality at the expense of others is sure to lead to error prone models.

Can the scientist not just construct instruments that more precisely measure nature than our own senses? The problem then is one of precision, and if science purports to understand the truth, or in other words perfection, then the precision of analysis also needs to be perfect. An imperfect description is just another guess with limited applicability. Does science not claim to be universal? A universal understanding with universal applications? No! This is the result of fools who speak about subjects of which they do not really understand.

IT IS CRITICAL TO UNDERSTAND THAT INFORMATION IS NEVER CONTAINED AND IS ONLY EVER INTERPRETED. As a consequence of this simple fact, there is NO inherent information CONTAINED in ANY sense or perception or instrumental reading: these results can ONLY ever be interpreted. Here lies the issue, the far away object and the limited interpretive subject. Personal subjective experience is popularly held to be the antithesis of scientific methodology and understanding.

Because of the nature of information, inner experience can never be accurately communicated and received with anybody else. Both the transmitter and the receiver of information must interpret, and therefore no objective information can be received. This is a very tricky situation and has led to the popular insistence upon confusion, arrogance, and ignorance of today's science.

Other Epistemological Issues

In the first edition of this text, I received a comment that falsification is the only way to know truth, a Popperian sentiment. I find this philosophy (Poppers) to be lacking in its creative ability. This negative methodology can only prove ideas wrong, and can never suggest what a thing is or the way forward. If a soulless science is desired, Popper provides. Probability comes up short for similar reasons. I do not care about the how or the statistic of, but the why. Probability only tells the experimenter the chance of some result, and not the why of that result. Empiricism would be fine if not for the fact that the subject matter, facts, are inherently non achievable without the reminder of personal understanding. Explain to me the "interpreted empirical fact".

Science

Science is any formal exploration of a domain of nature. This could be for any human experience but is best known for Physics, Chemistry, and Biology, the hard sciences. This has been occurring for over two millennia and started with the Greeks. Science is, through this exploration, the personal relationship that man has with nature. This is frequently remindatory, most often described as "ah ha!" moments, sudden glimpses of brilliance that flash in the scientist's mind upon connection with some idea. I do not view science as being a collective or group action. Because of the reasoning above, I see science as a highly personal experience that is very difficult to communicate to others and (almost?) never understood correctly by others. I will cite Marx here, in that he claimed to not be the marxist that his interpreters thought he was.

Science is frequently expressed in the form of ideas, mathematics, logics or abstract forms. The most common scientific product is the model, or a very precise tool scientists use to understand some one part of nature. It is also becoming more common for science to be referred to as poetic. A modern form of the scientific theory is the story, a means of conveying in the reader's mind the ideas of the writer. Journals, monographs, textbooks and university classes are all just stories of this highly personal experience.

Scientists in the course of their lifetime will package these ah ha! moments into narrative commodities and put them onto the market for other scientists. While somewhat obscured by fancy and self important writing and presentation, scientific products are these kinds of personal stories. Scientists like to call these stories theory.

Nature

Nature does not dictate to us in one specific description. Nature admits a class of equivalent descriptions that we pick from to use as a convention in a situation. Unless there is a direction of interest we do not observe at all. Our capacity to observe is limited, so we must decide for ourselves what will be important to us. Consumption is the arrangement of objects in our lives and its organization or design we decide for ourselves.

Theory

Nature is, by its nature, capable of being understood through theory. A theory is a hierarchical classification and organization of ideas, sequential and consumptive. Just as a house is not just a pile of bricks, a scientific theory is not just a disorderly pile of learned facts. While no fact by itself ever proves anything, many facts can be arranged into a structure of theory that can produce understanding. This understanding only has two considerations: completeness and consistency. Completeness is the ability of theory to explain and provide a framework for known fact, consistency is the absence of contradictions and conflicting results. As already stated, no man can have a complete model of nature, so his model will always be in some way inconsistent and incomplete.

His model will have loose ends and upon construction will suggest avenues to further thought. When this is done nothing new is learned, new ideas are only implied. Implication is very important in scientific exploration. This suggests areas of accessible but not yet explored thought.

Theoretical abstraction is the organization of knowledge acquired in given fields. These ideas and implications need to be arranged into a classification, or a web of interconnecting ideas and their relations. This classification will be a four dimensional abstract structure with inevitable loose ends and holes. These are your markers for further study. Consumption is the act of management, of balancing arranged ideas in an organized alignment. Care needs to be taken in the exact ordering and sequencing of ideas, of their relation between each other and as a whole. Absence also needs to be acknowledged, either as implication or as structure in itself. Ontology is crucial here, the sequencing of ideas, their origin, end, and teleology. A good idea arranged into an insufficient theoretical frame loses its explanatory power, and is forgotten until it is rediscovered and assembled into a better theory. A good theory oftentimes discovers identity in dissimilar phenomena. The prediction of future observations is both the goal and the test of truth of scientific theory: theory helps us by mapping out what we know and hinting at what is missing. Finally, ideas themselves need to be understood: this is self reflection.

The Origin of Theory

But where do these ideas come from, are they merely the caprice of the individual investigator? Yes! Indeed this is so! It should be hardly necessary for me to state that I am uninterested in an uninspired theory of knowledge devoid of curiosity and remindation. This is simply a matter of personal taste! Personality, experience, our own existence! Nature is these things, and through them, us, recapitulates an already completed ontology. Through nature, its substance and function, an organ is generated, one that can reflect upon nature. This organ's evolutionary development, a trajectory in ecology, is each unique.

This uniqueness, this subjectivity, is the problem we are discussing. Unless the investigator relies on himself he has nothing. Disinterested fools never think of anything and live poor, yet they have had a guide that is not their own thought! (*Applause*)

The Error of Construction

Because of the above, we can be sure that knowledge is not constructed, but instead interpreted or better yet, remembered by the investigator. I fail to believe that the answer to a simple mathematics equation is simply the result of the calculator performing the function, but is instead a set of a priori questions and answers that the investigator knows or is capable of knowing. An ah ha! moment is not the exclamation of a completed project, but the remindation of something already existing and somehow previously known.

The Difference Between Theory and Application

While theory is the arrangement of facts in man's mind or on paper, man needs to gather those facts in the first place. Fortunately enough nature seems to be just overflowing with facts. There are so many facts that for many people the importance of the fact is its verifiability or authenticity, rather than its presence or lack thereof. So how do we prove facts found in nature?

Before we begin we need to understand that science is only ever explained in part. Because of the limitations expressed above, we must live with partial explanation. While there is no assured way to prove anything, there are a few methods to at least ensure reliability.

One of the ways to find theory is to discover relevant factors of the same underlying phenomena in two or more different parts of nature. It is highly unlikely that the same phenomena is acting in two parts of nature and is unrelated. A familiar example is the phenomena that causes both the planets to move around the sun and for the apple to fall on Sir Newton's head. These phenomena or natural experiences are explored in experiments and verified by experiment.

The Role of Experiment

Experiment is the testing of an a priori assumption. Experiments could only ever "prove" the a priori assumption of the investigator to himself. Hypothesis, or the origin of the idea, lies in the experimenter's mind. The purpose of experiment is the verification of the idea already assumed. Remember that for us the concern is the remindation of the idea, and not the truth value of it. Consequently the experimental parameters are all presupposed: verified experiment is not the origin of the idea. An experimental fact can only be used as an intuition in finding further ideas. This is the purpose of empirical experimental results and are in no way useful on their own except as data points in theory construction.

In an experiment the scientist attempts to limit the outlying factors of investigation to more thoroughly examine the phenomena under inspection. Again, while no limit is ever good enough, a degree of exactitude is achieved and a measurement is taken. Further experiments refine the arbitrary measurements taken. This becomes verification of hypothesis.

application I name as the interaction between theoretical science and nature. Application is merely the repetitive and casualized use of scientific theoretical instruments. The reliability of data points to natural uses determines the degree of applicability in nature. Data points become concrete fact in the natural world, and nature regularly proves the fact.

The Difference Between Science and Medicine

Medicine is a separate and little related field to science. It has its own traditions, instruments, epistemology. Medicine is not science. Medical doctors may use the products of scientific investigation, but they are not themselves scientists and do not understand science. Medical doctors often take a minimum of science courses, most frequently cell biology, molecular biology, organic chemistry, virology; physiologists study that and anatomy. Medical doctors fail to understand scientific theory, the philosophy of science, the history of our studies and the deeper knowledge of philosophy. They, in my observation, cling to the same postmodern understanding of nature as the rest of the popular public. "Truth", "certainty", and "reliability" are all non-scientific sentiments, but are in fact medical concerns. Medical doctors have a fortune unavailable to natural investigators: namely that the subject of investigation is the same every time. An expected heart rate, blood pressure, behavioral affect can all be reliably charted and studied. Philosophy plays little role: this is one of the occupations in human experience where the "why" simply does not matter. To act despite the individual subject concerns of the doctor or patient is the essence of the hippocratic oath. Medicine is downstream of science, an application of its results with none of its philosophy or theoretical methodology.

Further Reading

Jean Baudrillard, *The System of Objects*, Verso 2020

Ernst Cassirer, *Substance and Function*, Dover 1980

Pierre Duhem, *The Aim and Structure of Physical Science*, Princeton 1954